Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 2 are rejected under 35 U.S.C. 102 as being anticipated by H'mimy (US 5,912,876).

Regarding claim 1, H'mimy discloses a method of noise variance estimation to be performed by a user equipment, comprising: Receiving a signal vector containing training sequence and noise vector transmitted via at least one propagation path from the base station;(Col. 2 lines 16-46)

Estimating the channel impulse response of each propagation path to construct a channel impulse response matrix, according to the signal vector; (Col. 2 lines 16-46)

calculating the noise variance of the signal vector according to the channel impulse response matrix and the signal vector if the channel impulse response remains primarily unchanged during the special time duration of the training sequence; (Col. 2 lines 29-46))

Regarding Claim 2, H'mimy discloses a method according to claim 1, wherein special time duration is the time duration of said training sequence. (Col. 2 lines 29-46)

Claim 6 is rejected under 35 U.S.C. 102 as being anticipated H'mimy (US 5,912,876).

Regarding Claim 6, H'mimy discloses an apparatus for noise variance estimation, comprising:

receiving means for receiving a signal vector containing training sequence and noise vector transmitted via at least one propagation path from the base station; (Col. 2 lines 16-46)

channel estimating means for estimating the channel impulse response of each propagation path to construct a channel impulse response matrix, according to the signal vector; (Col. 2 lines 16-46)

calculating means for calculating the noise variance of the signal vector according to the channel impulse response matrix and the signal vector if the channel impulse response remains primarily unchanged during special time duration of the training sequence. (Col. 2 lines 29-46))

Claim 7 is rejected under 35 U.S.C. 102 as being anticipated H'mimy (US 5,912,876).

Regarding claim 7, H'mimy discloses an apparatus according to claim 2, wherein said special time duration is the time duration of said training sequence. (Col. 2 lines 29-46)

Claim 10 is rejected under 35 U.S.C. 102 as being anticipated by H'mimy (US 5,912,876).

Regarding Claim 10, , H'mimy discloses a user equipment comprising: Receiving means for receiving a signal vector containing training sequence and noise vector transmitted via at least one propagation path from the base station;(Col. 2 lines 16-46)

channel estimating means for estimating the channel impulse response of each propagation path to construct a channel impulse response matrix, according to the signal vector; (Col. 2 lines 16-46)

noise variance estimating means for calculating the noise variance of the signal vector according to the channel impulse response matrix and the signal vector if the channel impulse response remains primarily unchanged during special time duration of the training sequence; (Col. 2 lines 29-46))

data detecting means for detecting the received signal vector to obtain the desired signal according to the computed noise variance of the signal vector. (Col. 2 lines 16-28)

Claim 11 is rejected under 35 U.S.C. 102 as being anticipated H'mimy (US 5,912,876).

Regarding Claim 11, H’mimy discloses a method according to claim 1, wherein special time duration is the time duration of said training sequence. (Col. 2 lines 29-46)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over H’mimy *(US 5,912,876)* in view of Matsumoto (US 2004/0247061).

Regarding Claim 3, H’mimy estimates the maximum likelihood estimation and calculates its value (Col. 5 lines 1-32), but does not expressly disclose calculating the noise variance. Matsumoto discloses a format for calculating variance according to a noise vector signal and said channel impulse response matrix (Figure 5: 0008, 0076) where he mentions a calculation of a “prior likelihood regarding the value of the transmitted value”. Therefore is would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the variance using maximum likelihood estimation, so the computed noise variance can meet the requirement for higher accuracy.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over H'mimy *(US 5,912,876)* in view of Matsumoto (US 2004/0247061).

Regarding claim 4, H’mimy derives a Fourier Transform for the time domain response over a radio link or channel including channel impulse response and Gaussian noise, but does not expressly disclose the formula for the noise variance. Matsumoto clearly expresses a formula after the cancellation of interference, implementing the Noise Variance, channel impulse response matrix, complex conjugate transposition, and estimate of the noise vector. Matsumoto also implements a prior likelihood in the equation which comes from the prior transmitted signal (0040). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the noise variance with the formula: O’2= $(n'Hn^{'})$ / $\mathit{trace}\{(HHH)^{-1\}}$ so the resulting value can achieve the desired accuracy in a channel.

Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over H’mimy *(US 5,912,876)* in view of Matsumoto (US 2004/0247061), further in view of Ghosh (US 2006/0114981).

Regarding claim 5, the combination of H'mimy and Matsumoto, discloses a method to compute a said noise variance, but does not expressly sum and average the noise variance. Ghosh clearly discloses a method of summing and averaging the noise variance in a wireless network where a packet error rate is maintained, which in return helps the system to be less sensitive to interference.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to sum and average the noise variance so that the obtained value will further improved the estimation performance.

Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over H'mimy *(US 5,912,876)* in view of B. Steiner (Low Cost Channel Estimation in the uplink receiver of CDMA mobile radio system (Pg. 292-298)), further in view of Matsumoto (US 2004/0247061).

Regarding Claim 8, H'mimy discloses means for estimating the maximum likelihood estimation and calculating the estimated value of the noise vector according to the MLE value of the training sequence and its value (Col. 5 lines 1-32), but does not expressly disclose the calculation with the equations:

s = (I~H)-IH~r = s + (I~H)-IH~n = s + n'

n' = s^-s = (I-~H)-IH~n

The combination of Matsumoto and (Steiner B.) disclose an apparatus to calculate the MLE value of the training sequence and its value.

Matsumoto clearly states that the maximum likelihood is exchanged in a feedback system through a channel equalizer (Fig. 3). In paragraphs (0031-

0041) Matsumoto includes an MLE equation to calculate the covariance matrix without any interference.

In paragraphs (10-13) Steiner B presents the MLE formulas where equations 3 and 4 are derived from. Therefore it would have been obvious to one of ordinary skill in the art to use equations 3 and 4 to calculate the noise vector according to the MLE value so it can be implemented in the noise variance calculation.

Calculating the noise power according to the estimated value would yield to the same Final variance of the signal according to the channel impulse response matrix and signal vector.

Matsumoto discloses a format for calculating variance according to a noise vector signal or noise power, and said channel impulse response matrix (Figure 5: 0008,0076) where he mentions a calculation of a “prior likelihood regarding the value of the transmitted value”. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the variance using the equations as mentioned, so the computed noise variance can meet the requirement for higher accuracy.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over H'mimy *(US 5,912,876)* in view of Matsumoto (US 2004/0247061).

Regarding claim 9, H’mimy derives a Fourier Transform for the time domain response over a radio link or channel including channel impulse response and Gaussian noise, but does not expressly disclose the formula for the noise variance. Matsumoto clearly expresses a formula after the cancellation of interference, implementing the Noise Variance, channel impulse response matrix, complex conjugate transposition, and estimate of the noise vector. Matsumoto also implements a prior likelihood in the equation which comes from the prior transmitted signal (0040). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the noise variance with the formula: O’2= $(n'Hn^{'})$ / *trace*$\{(HHH)^{-1}\}$ so the resulting value can achieve the desired accuracy in a channel.

Claims 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over H’mimy *(US 5,912,876)* in view of B. Steiner (Low Cost Channel Estimation in the uplink receiver of CDMA mobile radio system(Pg. 292-298)), further in view of Matsumoto (US 2004/0247061).

Regarding Claim 12, H’mimy discloses means for estimating the maximum likelihood estimation and calculating the estimated value of the noise vector

according to the MLE value of the training sequence and its value (Col. 5 lines 1-32), but does not expressly disclose the calculation with the equations:

s = (I~H)-IH~r = s + (I~H)-IH~n = s + n'

n' = s^-s = (I-~H)-IH~n

The combination of Matsumoto and (Steiner B.) disclose an apparatus to calculate the MLE value of the training sequence and its value.

Matsumoto clearly states that the maximum likelihood is exchanged in a feedback system through a channel equalizer (Fig. 3). In paragraphs (0031-0041) Matsumoto includes an MLE equation to calculate the covariance matrix without any interference.

In paragraphs (10-13) Steiner B presents the MLE formulas where equations 3 and 4 are derived from. Therefore it would have been obvious to one of ordinary skill in the art to use equations 3 and 4 to calculate the noise vector according to the MLE value so it can be implemented in the noise variance calculation.

Calculating the noise power according to the estimated value would yield to the same Final variance of the signal according to the channel impulse response matrix and signal vector.

Matsumoto discloses a format for calculating variance according to a noise vector signal or noise power, and said channel impulse response matrix (Figure 5: 0008,0076) where he mentions a calculation of a “prior likelihood regarding the value of the transmitted value”. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the variance using the equations as mentioned, so the computed noise variance can meet the requirement for higher accuracy.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over H'mimy *(US 5,912,876)* in view of Matsumoto (US 2004/0247061).

Regarding claim 13, H’mimy derives a Fourier Transform for the time domain response over a radio link or channel including channel impulse response and Gaussian noise, but does not expressly disclose the formula for the noise variance. Matsumoto clearly expresses a formula after the cancellation of interference, implementing the Noise Variance, channel impulse response matrix, complex conjugate transposition, and estimate of the noise vector. Matsumoto also implements a prior likelihood in the equation which comes from the prior transmitted signal (0040). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to calculate the noise variance

with the formula: $O'2=(n'Hn^{')} / trace\{(HHH)^{-1\}}$ so the resulting value can achieve the desired accuracy in a channel.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADNAN BAIG whose telephone number is (571) 270-7511. The examiner can normally be reached on Mon-Fri 7:30m-5:00pm eastern Every other Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lewis West can be reached on 571-272-7859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ADNAN BAIG/

Examiner, Art Unit 4172

/Lewis G. West/

Supervisory Patent Examiner, Art Unit 2618